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# T 3221

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2008.

Fourth Semester

Computer Science and Engineering

EC 1291 — ANALOG AND DIGITAL COMMUNICATION

(Regulation 2004)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Define coefficient of modulation and percentage modulation for an AM system

2. Determine the improvement in noise figure for a receiver with an RF bandwidth equal to 200 kHz and an IF bandwidth equal to 10 kHz.

3. A 20 MHz carrier is frequency modulated by a sinusoidal signal such that the peak frequency deviation is 100 kHz. Determine the modulation index and approximate bandwidth of the FM signal if the frequency of the modulating signal is 50 kHz.

4. How will you convert a frequency modulator into a phase modulator?

5. Why are synchronous modems required for medium and high speed applications?

6. What is $\mu$-law companding?

7. Determine the bandwidth and baud for the FSK signal with a mark frequency of 49 kHz and a space frequency of 51 kHz and a bit rate of 2 kbps.

8. Write the differences between PSK and FSK.

9. State the 'run property' of maximum length sequences.

10. How will you combat the effects of multi-path in a slow fading channel?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Define amplitude modulation. Derive the relation between the total transmitted power and carrier power in an AM system when several frequencies simultaneously modulate a carrier. (8)

(ii) For an AM DSBFC wave with a peak unmodulated carrier voltage $V_c = 10V_p$, a load resistance $R_L = 10\Omega$, and a modulation coefficient $m = 1$, determine

(1) Powers of the carrier, upper and lower side bands,

(2) Total power of the modulated wave

(3) Total side band power

(4) Draw the power spectrum. (8)

Or

(b) (i) Draw the block diagram of a AM super heterodyne receiver and explain function of each block. (8)

(ii) A super heterodyne radio receiver has a mixer that translates the carrier frequency $f_c$ to a fixed IF frequency of 455 kHz by using a local oscillator of frequency $f_{LO}$. The broadcast frequencies range from 540 to 1600 kHz. Determine the range of tuning that must be provided in the local oscillator

(1) When $f_{LO}$ is higher than $f_c$ and

(2) When $f_{LO}$ is lower than $f_c$. (8)

12. (a) Compare direct and indirect FM modulators. Draw the block diagram of a direct FM transmitter and describe its operation. (16)

Or

(b) Draw the circuit diagram of a ratio detector for FM demodulation and explain. State the advantages of a ratio detector over slope detector and Foster - Seelay detector. (16)

13. (a) (i) Draw the block diagram of typical DPCM system an explain. (8)

(ii) In a binary PCM system, the output signal to quantization noise ratio is to be held to a minimum of 40 dB. Determine the number of required levels, and find the corresponding out signal to quantization noise ratio. (8)

Or

(b) (i) Draw the eye diagram and explain its importance in data transmission. (8)

(ii) Write short notes on Vertical and Horizontal check Schemes for error detection. (8)

14. (a) Draw the block diagram of a QPSK transmitter and explain. Derive the bandwidth requirement of a QPSK system. (16)

Or

(b) Draw the block diagram of a non-coherent receiver for detection of binary FSK signals and derive the probability of symbol error for a non-coherent FSK system. (16)

15. (a) What is frequency hop spread spectrum? Explain the generation of slow frequency hop spread M-ary FSK and fast frequency hop spread M-ary FSK with appropriate diagrams. (16)

Or

(b) (i) Compare Time division Multiple Access and Frequency Division Multiple Access. (8)

(ii) A spread spectrum communication system has the following parameters : Information bit duration Tb = 4.095 ms, PN chip duration Tc = 1 $\mu$s, the energy to noise ratio $E_b / N_0 = 10$. Calculate the processing gain and Jamming margin. (8)